

EXHIBIT 11

**UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF CALIFORNIA
SAN FRANCISCO DIVISION**

ASETEK DANMARK A/S,
Plaintiff and Counter-Defendant,

v.

COOLIT SYSTEMS, INC.,
Defendant and Counter-Claimant,

AND

CORSAIR MEMORY, INC.,
Defendant.

CASE NO. 3:19-cv-00410-EMC

**UPDATED EXPERT REPORT OF
DR. JOHN P. ABRAHAM REGARDING
INVALIDITY OF ASETEK DANMARK
A/S'S ASSERTED PATENT CLAIMS**

I. SUMMARY

1. I have been retained by CoolIT Systems, Inc. ("CoolIT") as a technical expert to provide opinions regarding the validity or invalidity of the following patent claims (collectively the "asserted claims") from five patents that I understand are owned by Asetek Danmark A/S ("Asetek") and asserted against CoolIT in the above-referenced litigation:

Asserted Patent	Asserted Claim(s)
U.S. Patent No. 8,240,362 ("362 patent")	17, 19
U.S. Patent No. 10,599,196 ("196 patent")	1, 2, 13
U.S. Patent No. 10,613,601 ("601 patent")	1, 6, 11, 12
U.S. Patent No. 10,078,354 ("354 patent")	1, 8, 15
U.S. Patent No. 10,078,355 ("355 patent")	1, 2, 6

cooling plate module can be minimized to reduce space. The present invention further provides a cooling plate module, wherein there is no duct connecting between the cooling plate and the liquid driving module, the stagnant problem caused by pressure difference can be prevented and the cool liquid can directly flush the heat-dissipating plates for enhancing heat dissipation efficiency.” Duan at [0006] – [0008] (internal paragraph numbers omitted).

695. Shin similarly discloses: “The present invention pertains to a cooling structure for liquid cooling of heat generating electronic circuit components such as LSI chips installed on a wiring board, relating in particular to a cooling structure for compactly mounting a liquid cooled heat sink and pump. ... In recent years, the amount of heat generated by electronic equipment, as represented by computers, communication equipment, multimedia equipment, etc., has tended to increase markedly. In particular, the cooling of CPUs, which perform centralized computation processing, image processing LSI chips, power amplifiers and the like, has become a very important problem. Furthermore, as the cooling scheme, conventionally, an air cooling scheme combining air cooling fins with a fan has been frequently used. However, air cooling schemes have a low cooling limit compared to liquid cooling schemes, so recently, schemes have been considered for liquid cooling of high heat output LSI chips such as CPUs alone using a liquid coolant such as water. For example, Japanese Unexamined Patent Application Publication H8–32262 discloses a liquid cooling scheme as illustrated in FIG. 4. LSI chips 51, which do not have a high heat output and can be air-cooled, and LSI chips which are cooled by a water cooled heat sink 40 due to their high heat output, are installed on the same wiring board 50. The air-coolable LSI chips 51 are air-cooled by means of two fans 47. Cooling

air is supplied from outside, as shown by 48, and is exhausted as shown by 49. The water cooled heat sink 40 installed on LSI chips of high heat output is connected via a hose 41 to an outlet pipe 42, and the cooling water warmed at 40 is cooled in heat exchanger 43 by the air of the fans 47. The cooled cooling water flows through coolant pipe 44 to pump 45 and is pressurized and then passes through inlet pipe 46 and is supplied again to the water cooled heat sink 40. ... In the cooling structure disclosed in Japanese Unexamined Patent Application Publication H8-32262, the pump 45 is installed away from the wiring board 50 and water cooled heat sink 40, so space for mounting the pump 45 is required inside the case separately from the space for the pipes which are connected to the pump 45, and so there is the problem that the electronic equipment case cannot be made compact. It is an object of the present invention to provide a cooling structure for electronic devices which is compact, has low noise, superior cooling performance and high reliability. ... To achieve the aforesaid object, the present invention, assuming a cooling device for electronic equipment comprising a wiring board, a heat generating element including an electronic circuit component such as an LSI chip installed on the wiring board, a liquid cooled heat sink installed on the heat generating element in thermal contact therewith, and a pump which pressurizes and circulates a liquid coolant, adopts a structure wherein the pump is installed on the top part of the liquid cooled heat sink. Furthermore, the pump is secured to the top part of the liquid cooled heat sink, forming a structure that allows the pump and liquid cooled heat sink to be handled as an integral structure. Furthermore, a structure is formed wherein the liquid coolant discharge section of the pump is directly connected to the liquid cooled heat sink by means of a pipe, etc. Furthermore, an arrangement is adopted whereby the pump operates from a direct current

power supply. Moreover, a structure is formed whereby the pump is secured to the liquid cooled heat sink across a vibration absorption member or the like.” Shin [0001] – [0011] (paragraph numbers omitted).

696. Because both Duan and Shin are attempting to solve similar issues and each disclose or teach known techniques that can be used for the other, a POSA, when reading Duan and Shin together, would have been motivated to combine them.
697. Similarly, Ryu, for example, discloses: “In recent years, due to the rapid development of technology, the data processing speed of the central processing unit (CPU) is also being improved at a rapid pace. On the other hand, since the heat generated by the operation of the central processing unit increases according to the processing speed of the central processing unit, the amount of heat generated from the central processing unit has also increased as the processing speed of the central processing unit has increased. In general, the central processing unit shows the optimum performance as its temperature is close to room temperature and if the temperature gets too high, the processing speed decreases and the possibility of error in the processing result also increases. Furthermore, if the heat generation amount of the central processing unit is too high, it may cause the computer to stop working, which may cause loss of data. If this phenomenon persists, expensive central processing units may fail or break. Therefore, in order to solve this problem, it is necessary to cool the heat generated from the central processing unit and an air-cooled cooler, which lowers the temperature of the central processing unit by the rotation of the cooling fan, was used in the past. The present invention has been presented to solve the problems described above, and the object of the present invention is to provide a water-cooled cooling device for the computer central processing unit having an impeller for

cooling the heat generated from the central processing unit using the circulating cooling water. In other words, the object is to provide a water-cooled cooling processing unit for computer central processing unit that is capable of lowering the temperature of the central processing unit by passing the water, which has been cooled while going through the radiator, through the water jacket equipped to the central processing unit and cooling and circulating the water, which has been warmed up by the heat generated from the central processing unit, by pumping it to the radiator through the pump driving unit.” Ryu (pp. 2-4) (paragraph breaks omitted).

698. Because Duan, Shin, and Ryu are attempting to solve similar issues and each disclose or teach known techniques that can be used for one another, a POSA, when reviewing these references together, would have been motivated to combine Duan and/or Shin with Ryu and vice versa.
699. Further, for example, Koga discloses: “A speed enhancement technology has been developed rapidly in the computer industry, so that a clock frequency of a CPU becomes substantially higher than a previous one. As a result, the CPU produces too much heat for a conventional heat sink to air-cool the CPU. Thus a cooling device of high power and high efficiency is vitally required. One of such cooling devices is disclosed in Japanese Patent Application Non-Examined Publication No. H07-142886. This cooling device circulates coolant through a substrate on which heat producing electronic components are mounted, thereby cooling the Substrate.” Koga at 1:14-24. “The first conventional cooling device, however, needs cooler 103, radiator 104, pump 105 and a refilling tank (not shown) for refilling pump 105 with the coolant. Those elements are assembled into the cooling device, so that the device becomes bulky and complicated. As a result, it is

difficult to reduce the size of the device and the device becomes expensive. In other words, the first cooling device is basically fit for cooling a large size electronic apparatus, but is not suitable for a recent notebook-size computer which is compact, light-weight, slim, and carried in a variety of postures. The second cooling device can be used in a notebook-size computer; however, both of heat-receiving header 113 and heat-radiating header 114 are box-shaped and Substantially thick, which prevents the notebook-size computer from being slimmed. To be more specific, in the second cooling device, a reciprocating pump (not shown) is prepared in header 114. This pump has a rather narrower width than other pumps and works as the liquid driving mechanism; however, the thick ness of header 114 is specified by this pump, so that the overall thickness cannot be reduced. As a result, the notebook-size computer cannot be further slimmed.” Koga at 2:14-35. “A cooling device of the present invention includes a radiator and a centrifugal pump of contact heat exchanger model, both disposed in a closed circulating channel in which coolant circulates. Heat-producing electronic components are brought into contact with the centrifugal pump, so that the coolant in the pump collects the heat off the electronic components due to its heat exchanger function, and the radiator of the cooling device dissipates the heat. The centrifugal pump includes a pump-casing made of highly heat conductive material and an impeller. The pump casing has a heat-receiving plane formed on a side face along an interior pump room, and a sucking channel prepared between the heat-receiving plane and an inner wall of the pump room. On the inner wall of the pump room, a recess is provided. In this recess, protrusions extending toward the impeller or dimples are provided. According to the present invention, the cooling device

of a simple structure, which allows downsizing and slimming down, is obtainable while its cooling efficiency is improved.” Koga at 3:13-30.

700. Once again, because Duan, Shin, Ryu, and Koga are attempting to solve similar issues and each disclose or teach known techniques that can be used for one another, a POSA, when reading them together, would have been motivated to combine Duan, Shin, and/or Ryu with Koga, and vice versa.

701. Wu in a similar manner, discloses: “During the past decades technologies in electronics have improved tremendously. Devices Such as microprocessors have been become one of the major electronic components in many products Such as TVs, radios, home appliances and computers and gradually become part of people’s daily life. Transistors enabled people to make microprocessor more reliable, consume less power and have a higher working Speed. Further developments of the integrated circuits (ICs) allowed multiple electronic circuits to be combined on the Same chip. Since then, chip manufacturers tend to reduce the overall size of the microprocessors and concurrently increase the total number of transistors therein. Like many electronic devices, microprocessors have a range of operating temperature, below which the device would function well. Exceeding the operating temperature or an excessively high temperature would adversely affect the overall performance of the device. Exceeding continuously the operating temperature for a certain amount of time would result in device failure or damage. It is therefore understood that thermal management in present-day electronics plays a very important role, particularly when heat is generated during operation. The CPU produces heat during the operation of the computer. Heat must be quickly carried away from the CPU during the operation of the computer. Conventionally, thermal control is achieved by using a fan

to provide ambient air to the device. This type of cooling system generally requires a large Surface area So that more air can be directed to the device. However, manufacturers tend to develop chips in a compact size Such cooling system certainly does not meet the need. Other drawbacks of this type include slow heat transfer and energy-inefficient. Alternatively, a cooling system with water other than air can be used, and can be refrigerated rather than at the ambient temperature. Such cooling systems include those designed as Separate compartments, i.e., units for radiation and absorption. With Such Segregated components, leakage, Slow and unstable circulation resulted thereby leading to inefficient heat transfer. For example, U.S. Pat. No. 6,422,304 discloses an auxiliary cooling system for cooling a central processing unit (CPU) which includes an inner tube provided within an outer tube. A first end of the outer tube is attached to a fan and a Second end of the outer tube is attached to a housing of a computer adjacent the CPU. Inlet and outlet tubes are attached to a first end and Second end of the inner tube. A pump draws a cooling fluid from a cooling Source and passes the cooling fluid to the inner tube. As the cooling fluid passes through the inner tube, the temperature of the air within the outer tube is decreased. A fan is used to direct the cool air onto the CPU.” Wu at 1:17-67. “Similarly, U.S. Pat. No. 6,166,907 discloses a CPU cooling system for use in a computer to dissipate heat from the CPU of the computer comprising a water tank holding a liquid coolant, radiators, a water circulation pipe assembly for circulation of the liquid coolant through the radiators, and a pump external to the water tank whereby the liquid coolant is pumped through the water circulation pipe assembly. However, as the above prior art system has separate compartments, more efficient radiation is desirable. Although use of water may remove the heat and reduce the temperature produced by

electronic components, there is still a need for the development of a Stable, rapid, high energy efficient, Small capacity, impact resistant and leakage-free cooling system.” Wu at 2:11-24.

702. Once again, because Duan, Shin, Ryu, Koga and Wu are attempting to solve similar issues and each disclose or teach known techniques that can be used for one another, a POSA, when reading them together, would have been motivated to combine Duan, Shin, Ryu, and/or Koga with Wu, and vice versa.
703. Likewise, Yu discloses: “The fast advances of the computer industry have enabled the progress in computing power. With the processing speed of the central processing unit (CPU) growing, the heat which it generates also increases accordingly. In order for the CPU to remain functional at its allowed temperature, the industry has designed a variety of radiators and radiating fans with greater radiating area to help the cooling of the CPU with higher temperature. Please refer to FIG. 1. A known radiator 10a of a CPU has multiple radiating fins 11a to increase the radiating area. The radiator 10a is affixed on the top of the CPU 30a. A fan 20a may also be attached on a top of the radiator 10a. Therefore, the radiator 10a and the fan 20a can help cooling and maintain the function of the CPU 30a at the allowed temperature. However, the known radiator is a solid material, transferring the heat through dissipation, the rate of which is much lower of that of the generation of heat during the operation of the CPU, hence the poor cooling efficiency. Furthermore, with the improvement of processing speed, it will be increasingly difficult for the conventional radiator and fans to realize its function. As inferred from the above statement, the above-mentioned known radiator device obviously contains its inconvenience and defects in terms of usage, and leaves something to be desired.

Therefore, as the applicator saw the room for improvement thereof, he has dedicated himself to research and applied scientific theory to the desired improvement, and finally put forward the present invention, which is a sensible design and significantly improves the above shortcomings.” Yu at p. 22 (paragraph breaks omitted). “The primary objective of this invention is to provide a liquid-cooling radiator apparatus, which helps to force the cooling of the CPU through circulating cooling water and provides a more effective cooling method. Another objective of this invention is to provide a liquid-cooling radiator apparatus, wherein its fan is rotated synchronously with the pump and pumps the cooling water to circulate without additional power source needed. It is both space-saving and less costly. To achieve the above objective, this invention provides a liquid-cooling radiator apparatus comprising: a base with a reservoir inside; the reservoir with two ports which serves to store cooling water; a fan arranged on the base with a fan blade body driven to rotate; a pump arranged oppositely to the fan blade body of the fan and positioned inside the reservoir of the base; a magnetic connector unit arranged between the fan blade body and the pump; and a water circulation loop connected with the two ports of the base.” Yu at pp. 22-23.

704. Once more, because Duan, Shin, Ryu, Koga, Wu, and Yu are attempting to solve similar issues and each disclose or teach known techniques that can be used for one another, a POSA, when reading them together, would have been motivated to combine Duan, Shin, Ryu, Koga, and/or Wu, with Yu and vice versa.
705. In a similar manner, Batchelder discloses: “As the power to be dissipated by Semiconductor devices increases with time, a problem arises: within about ten years the thermal conductivity of the available materials becomes too low to conduct the heat from

the Semiconductor device to the fins with an acceptably low temperature drop. The thermal power density emerging from the chip will be So high in ten years than even copper or Silver spreader plates will not be adequate. A clear and desirable Solution to this problem is to develop inexpensive ways to manufacture more exotic materials like pyrolytic graphite or diamond that have even higher thermal conductivities. If the cost of these exotic materials does not fall quickly enough, an alternative solution is needed, such as will be discussed shortly.” Batchelder at 1:30-43. “Many heat transfer Systems use an external Source of energy to pump a recirculating heat transfer fluid. Most of these do not incorporate the pumped heat transfer fluid in an active spreader plate geometry that can be implemented as a replacement for a passive spreader plate. Most of these incur the cost disadvantage of requiring Separate motors to impel the heat transfer fluid and to impel the atmosphere. Most of these incur the reliability disadvantage of using Sealed shaft feed-throughs to deliver mechanical power to the heat transfer liquid. Most incur the added assembly cost and reliability exposure associated with hoses and fittings. None of these existing heat transfer Systems simultaneously use a Single motor to drive an impeller for the heat transfer fluid and an impeller for the atmosphere, use moving external magnetic fields to eliminate a rotary seal, and use monolithic assembly without hoses or fittings.” Batchelder at 1:62-2:10.

706. As discussed before, because Duan, Shin, Ryu, Koga, Wu, Yu, and Batchelder are attempting to solve similar issues and each disclose or teach known techniques that can be used for one another, a POSA, when reading all of these references together, would have been motivated to combine Duan, Shin, Ryu, Koga, Wu, and/or Yu with Batchelder and vice versa.

707. Likewise, Nakano discloses: “The present invention relates generally to a cooling device for cooling a semiconductor element which generates a substantial quantity of heat and, in particular but not exclusively, to a compact, easy-to-handle and efficient cooling device for cooling such a semiconductor element by utilization of a change in phase between a liquid phase and a vapor phase of a refrigerant.” Nakano, [0002]“Japanese Laid-Open Patent Publication No. 2000-208683 discloses a natural circulation type cooling device for cooling a heating element by utilization of a change in phase between a liquid phase and a vapor phase of a refrigerant, as shown in FIG. 1. The cooling device shown therein is provided with a refrigerant tank 20 for storing a liquid refrigerant, a radiator 22 for radiating heat from a vapor refrigerant, and a fan (not shown) for cooling the radiator 22. Because this cooling device is not provided with an inverter-controlled refrigerant pump, it controls the required cooling power merely by changing the number of revolutions of the fan depending on the amount of heat generated by the semiconductor element. Furthermore, Japanese Laid-Open Patent Publication No. 2000-208683 lacks any disclosure of an avoidance system in an abnormal situation. The present invention has been developed to overcome the above-described disadvantages. It is accordingly an objective of the present invention to provide a highly reliable semiconductor cooling device that is low in noise level and can conduct an appropriate control by changing the amount of circulation of refrigerant depending on the amount of heat generated by a semiconductor element.” Nakano, [0004] – [0008] (paragraph breaks omitted).
708. Again, because Duan, Shin, Ryu, Koga, Wu, Yu, Batchelder, and Nakano are attempting to solve similar issues and each disclose or teach known techniques that can be used for

one another, a POSA, when reading all of these references together, would have been motivated to combine Duan, Shin, Ryu, Koga, Wu, Yu, and/or Batchelder with Nakano, and vice versa.

709. Likewise, Laing discloses: “The invention relates to a device for the local cooling or heating of an object by means of a liquid, comprising a circulation pump for the liquid. Devices of this type are used, for example, for the liquid cooling of microprocessors. In accordance with the invention, a device for the local cooling or heating of an object is provided which is of simple design since a thermal contact element for making thermal contact with the object is integrated in the circulation pump. Therefore, according to an embodiment of the invention, a thermal contact element such as a heat sink or heater which is brought into contact with the object is part of the circulation pump. In this way, it is possible to achieve a compact design of a liquid cooling device or heating device with effective cooling or heating of the object with which contact is made.” Laing [0002-0005]. Laing further describes an embodiment that can be used for the liquid cooling of a processor: “An exemplary embodiment of a device according to the invention for the local cooling or heating of an object, which is denoted overall by 10 in FIG. 1, comprises a circulation pump 12, by means of which a fluid, such as water or other liquids, can be guided in a loop (FIG. 2) as a heat transfer medium. The heat transfer medium can be used as a cooling medium, in order to cool an object 14, such as for example an electronic component, such as a processor, which is positioned on a circuit board 16, for example. The heat transfer medium can also be used for heating an object. The circulation pump 12 comprises a housing 18. A feed line 20 is provided to allow a fluid to enter into the housing 18 by means of an opening 22 leading into a suction side of the

circulation pump 12. A discharge line 26 leads away from the housing 18 via an opening 24 from a pressure side (delivery side) of the circulation pump 12. The housing 18 may be pressed onto the object 14, for example by means of pressure-exerting clips (not shown). If the device is used as a cooling device, a cooling fluid, such as water, is supplied via the feed line 20, and heated cooling liquid which has been heated as a result of the cooling of the object 14, is discharged via the discharge line 26.” Laing [0044 – 0047].

710. Again, because Duan, Shin, Ryu, Koga, Wu, Yu, Batchelder, Nakano and Laing are attempting to solve similar issues and each disclose or teach known techniques that can be used for one another, a POSA, when reading all of these references together, would have been motivated to combine Duan, Shin, Ryu, Koga, Wu, Yu, Batchelder and/or Nakano with Laing, and vice versa.
711. In sum, for the same reason as stated above, a person of ordinary skill in the art would have been motivated to combine the cited references in this report in a variety of combinations if reading these references together.

XIII. ENABLEMENT OF PRIOR ART REFERENCES

712. I am informed that to show obviousness, the defendant does not have a burden to show that the prior art is enabling. Nevertheless, in my opinion, each of the prior art references cited herein provide sufficient detail to enable a person of ordinary skill in the art to practice the asserted claims without undue experimentation, and when used in combination, would provide a POSA with a reasonable expectation that the combination

would be successful. That is, even if there were a requirement that each prior art reference be enabling, those references would satisfy such a requirement.

713. In my opinion, each of the Duan, Shin, Ryu, Koga, Wu, Yu, Batchelder, Nakano and Laing references enables a POSA to build and practice the disclosed cooling devices for their intended purposes. Each reference provides detailed drawings, figures, and/or schematics showing the structures of the disclosed cooling devices and their arrangements when used with the heat generating components that the cooling devices are supposed to cool. Each reference also provides detailed descriptions and/or drawings, figures, and/or schematics showing the inner workings of the disclosed cooling devices and how the cooling fluid flows through them. The references also all disclose or teach conventional components that would have been well known by a POSA, who would have been able to put them together in a known way with predictable results and a reasonable expectation of success.
714. When the cited references are combined or modified as a POSA would have been motivated to do, the combination or modification is also based on conventional or known methods that would have yielded predictable results and been reasonably expected to be successful by a POSA.

XIV. SECONDARY INDICIA OF NON-OBVIOUSNESS

715. I understand the following secondary factors, for example, can be considered to show non-obviousness.
- Commercial Success
 - Long-Felt Need/Skepticism
 - Copying

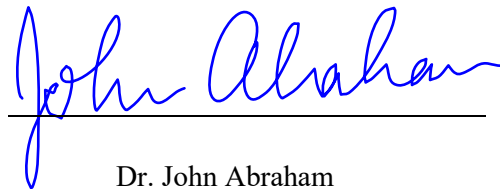
763. As noted from the above-referenced Asetek documentation, the new design improves the thermal performance, reduces noise, and overclocking

"Asetek Gen4 products combine the micro-channel cold plate technology from our Gen3 products with the center inlet, split-flow design of Asetek's WaterChill Antarctica architecture cold plates," said André Sloth Eriksen, Founder and CEO of Asetek. "The split-flow Antarctica architecture was state-of-the art when we introduced it back in 2004 and by combining it with newer micro-channel technology, we are pushing the theoretical performance limits of copper cold plate design."

The new Gen4 cold plate is paired with a completely redesigned pump that provides better coldplate efficiency. Asetek's new pump produces higher pressure and distributes coolant more optimally. Gen4 products provide 20% less thermal resistance than the previous generation, resulting in lower CPU core temperatures. This provides computer enthusiasts the highest thermal headroom for overclocking at the lowest noise possible.

764. As acknowledged by Asetek's own documentation, the change from Gen3 to Gen4 and the incorporation of a central flow arrangement led to a reduction of noise, improved thermal performance, and an ability to overclock CPUs. Clearly, these attributes can be attributed to Asetek's move from Gen 3 (non-infringing) to Gen 4 (infringing) products.
765. I have inspected a physical copy of the Gen4 Asetek system and confirm it is a central flow arrangement, as discussed above. I am not aware of relevant factors that would indicate non-obviousness of the asserted patents.

Date: November 3, 2021



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